

DIGICLEAN

“Automated monitoring of industrial cleaning processes”
a Vinnova / PiiA funded project

In the Vinnova funded project, Digiclean, IKPAB together with RISE, Chalmers Industriteknik, Gnosjö Automatsvarvning AB, Parker Borås, Volvo, SKF, and Clemondo are collaborating to create an AI-based digital platform to support industrial washing processes and thus transform a product company to a service company. This endeavor led IKPAB to embark on a series of research projects, to ensure that they can offer their customers a digitalized, cost-effective, environmentally and ethically conscious process, with an improved cleaning result. It has also led to the formation of a new, spin-off company that will be called Digiclean Solutions AB, in honor of the project that brought them to this point.



Digiclean 1 (2021 – 2024) was initiated under the premise of taking previous research to a Technology Readiness Level (TRL) and verifying that automated online collection of required properties is possible. To expand on the work of Digiclean 1, Digiclean 2 (2023 – 2025) continues, with another year planned for research and development. The aim, however, has always been to develop and implement technologies – from sensors to insight – that extend the life of metal cleaning baths.

In addition, to testing the technology in other industries. With this goal in mind, Digiclean Solutions AB is adjusting their business model, from business-as-usual, with a focus on sale of products (chemicals) to a focus on sale of a process (or cleaning result) where products are only a part of a full offer.

IKPAB (Digiclean Solutions AB) is a third generation, family-owned chemical company that manufactures their own range of degreasers for industrial metal washing machines. The company began as a surface treatment chemical supplier but has evolved over the years. This was in part due to the acquisition of 40 years metal washing expertise in 2016 and then of WAVI’s fluid cutting analysis technology in 2022, but has culminated in a business model shift, away from product provider but rather to service provider.

This evolution has been enabled by the Digiclean project team and their important contributions, which include competencies in project management and business model development (RISE); machine learning operations (MLOPs) and AI-machine learning and sensor development (Chalmers Industriteknik); and pilot testing (Gnosjö Automatsvarvning AB, Volvo, SKF, and Clemondo). This collaboration has led to many lessons learned, process improvements and growing customer interest.

“The demand for technical cleanliness - within the industry - is getting higher due to more complex products. We see that our customers are aiming for more sustainable resource use and traceable process maintenance to control the parameters in the washing process. The uniqueness is our long experience and expertise, and the ability to make insights on sensor data. And importantly, our focus on resource efficiency and shifting our focus to the real customer value: a sustainable result.”

Charlotte Stigen Låstberg, Digiclean Solution’s CEO

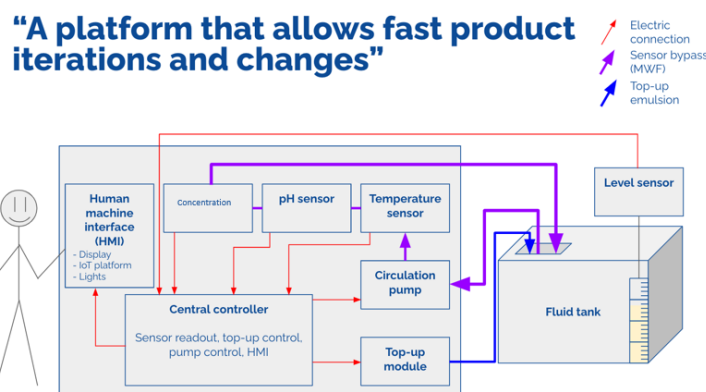
During Digiclean 1 the project team developed a sensor suit and associated analytic software that automates the analysis of cleaning fluids. In addition, successful development of a hardware/software platform that predicts the cleaning capacity of the fluids online in-real-time by analyzing key factors such as temperature, pH, and electrochemical impedance. Through the implementation of advanced multivariate data analysis, AI prediction models and visualization techniques, Digiclean Solutions AB can now track the aging of the liquid and accurately map the changes that occur. These developments offer a comprehensive solution for monitoring and assessing the effectiveness of the cleaning process and enable users of the technology to better understand the bath life cycle and how to prolong it.

These important developments, in addition to the WAVI technology, have enabled the project team to develop a model which demonstrates correlation and reliability of the technology to predict cleanliness; leading to the creation of their digital platform, Optimera, which minimizes the number of bath changes without risking technical cleanliness.

This technology benefits the customer, workers, and the environment due to reduced costs, minimized exposure to chemicals and reduced environmental impact.

Digiclean Solutions AB plans to be the first chemical company in Sweden with such an approach, and perhaps even expand their service to other industries (i.e. surface treatment and water treatment) looking for data-driven solutions to automate their decision-support systems. Another competence and offering of Digiclean Solutions AB is the ability to specially adapt their chemistry to their customers’ conditions. To do so, several analysis methods and modeling data are used to predict how washing baths will develop over time; this allows for the timely detection of deviations and reduces the risk of destroying a metal bath prematurely.

Since the launch of Digiclean 1 there have been several positive results including more efficient use of raw materials and decreased waste, which has the potential to reduce the environmental impacts of the manufacturing industry, thus offering Swedish companies a competitive advantage.



“It is crucial to view this initiative as an entire process that supports both traceability and sustainability. Emphasizing digital transformation at every step of the cleaning value chain is essential to achieving these goals. This comprehensive approach ensures that improvements in technology and processes contribute to a more sustainable, traceable, and efficient cleaning system, aligning with broader environmental and quality standards”.

Abdulrahman Kanaa, Research Leader and Digiclean Project Manager, RISE

Digiclean Solutions AB has shown the ability to increase the bath life by 13 times, through controlling parameters and by doing manually handled analyses. They have also seen reduced financial costs of 400 SEK for one washing process, with this technology; by adding missing chemicals only when needed, compared to replacing the entire bath prematurely; this, in addition to a reduction in chemical usage by nearly 60 percent.

However, there is one main challenge – seemingly industry-wide – which is how to assess component cleanliness, as results often differ from one standard control to the next. In addition, a challenge is customer education, as there are not only hidden costs but also hidden possibilities, which Digiclean Solutions AB, is working to make more transparent through direct and customized customer service.

In 2023, a collaboration was initiated between IKP AB (Digiclean Solutions AB) and Parker in Borås, Sweden, where the goal was to optimize one of Parker’s industrial cleaning processes. Three separate trials have been run since this point, using IKP washing liquids and Optimera sensor system, all with promising results. Prior to the partnership, Parker changed their baths every 2-4 weeks, now down to once every 10 to 12 months, which translates to a chemical consumption reduction of 57 percent. This also has led to less waste, or an 800 percent improvement, when comparing the 45,000 liters of waste pre-trials to post trials with 1,600 liters. Additionally, Parker saw a CO₂ reduction of 18 tons yearly for one washing process and financial savings of \$37,200 (SEK 380,000).

In an interview with Ulrik Torstensson, a process fluids technician from Parker, he spoke about the experience working with IKPAB (Digiclean Solutions AB), saying that they were completely satisfied when it came to both the product and customer service. When asked what differentiates IKPAB (Digiclean Solutions AB) from their competitors Torstensson emphasized their customized chemistry and good customer service. Additionally, he felt that the service was worthwhile because it offered financial savings as well as environmental benefits, and noted that with their fast and customizable service, knowledgeable and professional staff, he would not hesitate to recommend IKP to a fellow technician or company.

IKP client, Parker Borås, would not hesitate to recommend IKP to others, saying that their service is, fast, customisable, professional and knowledgeable.

As Digiclean 1 ends and Digiclean 2 begins in earnest, the focus is to scale up the AI-platform for the analysis of cleaning fluids, with the intention of adapting both hardware and software to a range of compositions of washing fluids used by different users. This requires an expanded consortium with additional end-users who use washing fluids differently, thus providing models with real, varied data to explore the possibilities of a universal or tailor-made prediction model(s). A key to success is gathering several rich and extensive datasets from real customer environments, thus the inclusion of new partners (Volvo, SKF, and Clemondo).

In the case of Clemondo, Digiclean Solutions AB is exploring new applications of their technology.

The formation of Digiclean Solutions AB was the first step in making data-driven monitoring technology a reality. According to Stigen Låstberg, the next step is to run more successful pilot tests, of which there are ten scheduled over the next six months. In addition to the vital step of finding investors, which will help to ensure scalability. Finally, Stigen Låstberg emphasizes the importance of quality assurance and standards, and the value of customer input.

The intrinsic value of successful pilot tests, positive testimonials and happy informed customers cannot be understated, but the true driving force behind Digiclean Solutions AB is the desire to change course and map a future as a service company; one that focuses on the results instead of the quantity of chemicals sold. This vision will lead Digiclean Solutions AB into the leadership realm of chemical companies that cut fluids, resulting in reduced customer costs, and minimized environmental impact. It may also result in continued work, in the form of Digiclean 3, with next steps to expand applications further and close the loop to achieve a fully automated process.

